

DOCUMENT RESUME

ED 172 942

PS 010 697

AUTHOR Worden, Patricia E.; Sladewski-Awig, Linda J.
TITLE Children's Mnemonic Judgments and Metamemory.
PUB DATE Mar 79
NOTE 16p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (San Francisco, California, March 15-18, 1979) ; Not available in paper copy due to print quality.

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Age Differences; Cognitive Development; Elementary School Students; Kindergarten Children; *Memorizing; *Mnemonics; Psychological Studies; *Recall (Psychological); Research
IDENTIFIERS *Metamemory Processes; Signal Detection Analysis

ABSTRACT

The nature of young children's inaccuracy in predicting their own memory performance was studied using categorical and unrelated material. Twenty-four children at each of four grade levels (kindergarten and grades two, four, and six) were presented with 18 cards bearing pictures of concrete nouns. Categorical pictures were presented on the right half of the array, and unrelated items were on the left. The children were asked to predict which items they would later recall, and to justify why they predicted recall for those particular items. Both recall and prediction accuracy increased developmentally. Kindergarteners were significantly less accurate than older children in predicting recall. Older children's justification indicated that they were aware of the characteristics of items which make them memorable; while younger children tended to refer to their own alleged cognitive abilities. For example, older children referred to the familiarity or difficulty of items, while kindergarteners mentioned their own smartness or good memory. Signal detection analysis of recall performance and recall prediction data indicated, however, that the mean level of separation of memorable from nonmemorable items varied as a function of list and not grade level. Also, there was no grade by list interaction. These results suggest that children's sensitivity to such information is not a developmental variable, and that young children's poorer performance is due instead to a more liberal response criterion, or a tendency to overpredict the number of items they will remember. (Author/SS)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

Patricia E.
Worden

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

CHILDREN'S MNEMONIC JUDGMENTS AND METAMEMORY

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Patricia E. Worden and Linda J. Sladewski-Awig

California State University, Fullerton

Society for Research in Child Development, San Francisco, 1979

Our study involved a familiar task and a familiar result-- that young children's memory estimates are often surprisingly inaccurate. We were curious about the nature of young children's inaccuracy. Memory estimation tasks have included prediction of recall readiness (Flavell, Friedrichs, and Hoyt, 1970), memory span prediction (Yussen and Levy, 1975), prediction of serial recall (Flavell et. al., 1970), estimation of location recall (Kelly, Scholnick, Travers, and Johnson, 1976), and prediction of the future contents of recall (Monroe and Lange, 1977). We chose the prediction of contents task, both for theoretical reasons and for practical reasons. First, awareness of the probability that particular items can be remembered would seem to be one of the fundamental ingredients necessary for efficient study. Second, the task produces especially interesting results: by asking subjects to specify which particular items they think they will be able to recall, we then have the data necessary to perform a signal detection analysis.

The signal detection model is especially useful because the analysis provides information about two distinct sources of estimation inaccuracy: (1) poor "sensitivity" to the memorability information itself, and (2) inappropriate response bias. The

ED172942

PS 010697

first has to do with proposed underlying distributions of memorable and nonmemorable events, which correspond to signal and noise distributions, respectively. The more accurately one can distinguish between items which will be recalled and items which will not be remembered, the greater the separation of the two distributions (or, the larger the parameter which measures such separation, d'). A high d' , then, means that the subject has good information about items which are high in memorability and items which are low in memorability. A low d' could result from either of two problems: (a) the memorability information is of poor quality-- that is, the two distributions overlap to a great degree; or (b) the information about memorability is present and distinct, but the process which monitors such information is ineffective. In either case the result is the same: a blurring of the distinction between memorable and nonmemorable items, which would cause the two distributions to merge together, reducing sensitivity.

Now let's consider the phenomenon we seek to understand. Children's ability to predict their future memory performance improves with age. Why are kindergarteners so inaccurate in this task? Is their inaccuracy due to (a) faulty memorability information, or to (b) an inefficiency in the process which monitors this information, (c) or both? If so, our task should result in a low mean d' for the kindergarten group. We generate the d' data by comparing the proportion of hits (pictures the children said they would remember which they did), with the proportion of false alarms (pictures children said they would remember, but

didn't). D' should increase with age if the sensitivity to information about recallability improves as children grow older.

Next let us consider the second component of the signal detection process--the response. Note that the conservatism with which the subject responds "Yes, I will remember that item," can vary independently of the underlying discrimination of memorability. That is, regardless of how separate are the two distributions of recallable and nonrecallable items, the criterion upon which the subject decides to make a "yes" or "no" prediction can vary from liberal to conservative. A more liberal criterion results in a greater proportion of "hits", but also a greater proportion of "false alarms". A more conservative cutoff criterion would avoid more of the false alarms, but would also result in fewer hits. The point is that the criterion for the judgment and the underlying information on which the judgment is based are two separate factors in the signal detection model. Thus it is possible that the memorability information and kindergarteners' sensitivity to it are just as good as in older children, but the younger children's poor accuracy is due to a too-liberal response bias. The evidence seems to support this view.

We designed a study involving a number of related tasks, not all of which will be presented here. We tested 24 children each in grades kindergarten, two, four, and six. They were presented with 18 cards bearing pictures of concrete nouns. Subjects received one of four mixed categorical and unrelated lists (shown on the first page of your handout; see Table 1). Categorical pictures were presented on the right half of the array, and unre-

lated items were on the left. The first slide shows the main phases of the procedure. These were a prediction-recall task, a study-recall task, a sorting task, and a final prediction task involving prediction of others' performance (see Table 2). The major results in this report come from the prediction-recall phase and the prediction-of-others' performance phase.

Table 1 and Table 2 about here

In the first phase, after the subjects had named each item, we asked them to predict which items they would later recall. We also asked them to justify why they predicted recall for those particular items. As initial results (shown on the second page of the handout, and in the next slide), recall increased significantly with increasing age, and more relevant, prediction accuracy also increased developmentally (see Table 3). Note that accuracy improves as these scores approach zero. Kindergarteners were significantly less accurate than older children at estimating the number of items they would later recall. This is the result we're trying to understand in this study.

Table 3 about here

When we considered the justifications children gave for why they predicted recall for particular items, we found an interesting developmental trend, as shown on the next slide (see Table 4). The children's justifications were classified into the ca-

categories shown in the column captions: familiarity/preference ("I like hot dogs"), difficulty/spatial features ("I picked the easy ones"), own ability ("I just think I'm pretty smart"), don't know, and other. The first two rows show the frequency and the mean grade level of responses in each of the category types. We found that the subjects who mentioned item characteristics such as familiarity/preference or difficulty/spatial features were significantly older than subjects who described their own alleged ability. A typical response judged to show familiarity/preference was given by a sixth grader: "for one reason, my dad's a fireman, I use a saw a lot, my mom uses a pan to cook with, I catch ladybugs, I eat rice krispies sometimes, I lost a frog and there's a turtle in the library, and I caught a fish!" In contrast, consider these justifications given by kindergarteners: "'Cause I have a good mind," "'Cause I have a good rememberie," "'Cause I have the smartest brain!" Thus, older children showed more evidence that they were aware of the characteristics of items which make them memorable. Very young children, on the other hand, tended to refer to their own alleged cognitive abilities.

Table 4 about here

Is this the reason for the inaccurate memory appraisals? Are kindergarteners unable to use the familiar or distinctive characteristics of items to guide their memory estimates? Before

we come to this conclusion, we must consider whether justifications are the best data. They are, after all, given post hoc and may be influenced by irrelevant factors such as demand characteristics, or general inarticulateness. We therefore turned to data which compared picture predictions with actual performance and looked at the signal detection analysis.

The next slide shows the results of a grades by lists analysis of variance of the d' data (see Table 5). As you can see, mean d' did not vary as a function of grade level, but rather as a function of list. [The means which share common subscripts do not differ significantly from one another.] Lists D and C showed poor levels of discrimination of recallable and non-recallable items. Performance on list A was significantly better, and performance on list B significantly exceeded that on all other lists. There was no grade by lists interaction. These results illustrate quite clearly that memorability information in the stimulus array can be more or less discriminable, depending on the list. What is important is that children's sensitivity to such information does not seem to be a developmental variable.

Table 5 about here

Neither the proposed underlying distributions of recallable and nonrecallable items nor the process which monitors such information can be very faulty in kindergarteners, since that would result in a lower d' for that group. Nevertheless, Kindergarteners consistently overpredict the number of items they will

remember. It seems they are using a more liberal response criterion, the result of which is that kindergarteners increase the number of hits, but also the number of false alarms. Since the overall relationship between hits and false alarms does not vary, d' remains constant. Thus, the signal detection results point to a criterion shift as the most likely explanation for young children's poor accuracy in memory estimation tasks.

Of course, none of this tells us why very young children seem more willing to risk false positives when making their predictions. Most likely it is their lack of experience with such mnemonic judgments which contributes to their ignorance of the consequences of a low criterion. This is supported by Markman's (1973) finding that young children improve their estimates when given practice. Lack of such experience leads kindergarteners to report recallability for low probability items. Experience leads to a criterion shift in the more conservative direction.

Experience also seems to lead to a shift in the kinds of justifications given for memory predictions. In the third phase of the procedure, we had the children predict which items a younger child would remember, and they also had to explain why. Looking back at the last slide, the center's rows on this table show the frequency and mean grade level for each of the justification categories. The only difference in the categories is that the "own ability" justification now becomes the "developmental" justification--a reference to the cognitive ability or maturity of the other individual rather than oneself. The results show a very similar pattern to that for phase I predictions of one's own

performance. That is, predictions which refer to item characteristics are given by older subjects, while younger subjects (if they say anything reasonable at all) tend to refer to the reduced cognitive capacity of the younger individual.

We asked the children to make the same judgments for the performance of an older individual. The pattern of results this time was strikingly different. As shown in the lower rows of the table, the overwhelming response of subjects at all grades was the "developmental" response. Sixty-three of our ninety-six subjects fell into this category. As a result, there was no age-related variation in justifications for performance of an older individual.

Thus, when making predictions about the items which a younger person is likely to recall, subjects give much the same kinds of explanations as they did for their own performance. When asked about a person older than themselves, however, they have no relevant experience on which to base their justifications. Since they have no direct knowledge of what makes items memorable for older individuals, subjects revert to the developmentally prior response. They explain, in essence, "the older kids will remember these pictures because they're older and smarter."

In closing, I'd like to leave you with two main points from our study. (1) Because d' did not increase with age, we concluded that children at all ages have equal access to information about memorability in this task. (2) We believe that inaccurate estimates by kindergarteners are based on a too-liberal response

bias, which with experience becomes more conservative. Thus we now have a more specific understanding of the reason for young children's inaccuracy in this version of the memory estimation task.

References

- Flavell, J.H., Friedrichs, A.G., and Hoyt, J.D. Developmental changes in memorization processes. Cognitive Psychology, 1970, 1, 324-240.
- Kelly, M., Scholnick, E.K., Travers, S.H., and Johnson, J.W. Relations among memory, memory appraisal, and memory strategies. Child Development, 1976, 47, 648-659.
- Markman, E.M. Factors affecting the young child's ability to monitor his memory. Doctoral Dissertation, University of Pennsylvania, 1973.
- Monroe, E.K., and Lange, G. The accuracy with which children judge the composition of their free recall. Child Development, 1977, 48, 381-387.
- Yussen, S.R., & Levy, V.M., Jr. Developmental changes in predicting one's own span of short-term memory. Journal of Experimental Child Psychology, 1975, 19, 502-508.

Arrangement of Pictures into Four Counterbalanced Stimulus Lists

General Categories of Items

- | | | | |
|--------------|-------------|---------------------|--------------------|
| 1. Animals | 4. People | 7. Insects | 10. Pond Creatures |
| 2. Meat | 5. Desserts | 8. Vegetables | 11. Cereals |
| 3. Furniture | 6. Tools | 9. Kitchen Utensils | 12. Transportation |

The Four Stimulus Lists

- | <u>LIST A</u> | <u>LIST B</u> | <u>LIST C</u> | <u>LIST D</u> |
|--------------------|-----------------|-------------------|--------------------|
| 1.* lion | 4. farmer | 7. ant | 10. frog |
| 1. elephant | 4. cowgirl | 7. fly | 10. fish |
| 1. monkey | 4. indian | 7. ladybug | 10. turtle |
| 2. hotdog | 5. ice cream | 8. peas | 11. frosted flakes |
| 2. hamburger | 5. cake | 8. carrots | 11. fruit loops |
| 2. turkey | 5. pie | 8. corn | 11. rice krispies |
| 3. chair | 6. hammer | 9. tea kettle | 12. fire engine |
| 3. bed | 6. saw | 9. pot | 12. car |
| 3. table | 6. screwdriver | 9. frying pan | 12. bus |
| 4. farmer | 1. elephant | 1. monkey | 1. lion |
| 5. ice cream | 2. hamburger | 2. turkey | 2. hotdog |
| 6. hammer | 3. bed | 3. table | 3. chair |
| 7. ant | 7. fly | 4. indian | 4. cowgirl |
| 8. peas | 8. carrots | 5. pie | 5. cake |
| 9. tea kettle | 9. pot | 6. screwdriver | 6. saw |
| 10. frog | 10. fish | 10. turtle | 7. ladybug |
| 11. frosted flakes | 11. fruit loops | 11. rice krispies | 8. corn |
| 12. fire engine | 12. car | 12. bus | 9. frying pan |

*Numbers refer to the categories from which the items were selected

Table 2

Outline of Method

- I. Prediction -----Recall 1
Which items?
Why?
- II. Study ----- Recall 2
Why?
Study Behavior

Sorting
Free
Constrained
- III. Prediction (Others' Performance)
Younger/Older
Which Items?
Why?

Table 3

Recall and Prediction Accuracy^a

Measure	Grade			
	K	2	4	6
Recall	6.96 a	9.79 b	11.22 c	12.50 d
Accuracy	1.02 a	.33 b	.36 b	.35 b

^aNote: accuracy improves as scores approach 0.

Categories of Justifications: Frequency and Mean Grade Level

	Familiarity/ Preference	Difficulty Spatial	Own Ability or Developmental*	Don't Know	Other
Older Performance:					
Frequency	18	20	14	34	10
Mean Grade	3.78 _a	4.00 _a	1.00 _b	2.65 _a	3.60 _a
Younger Performance:					
Frequency	38	17	11	21	9
Mean Grade	3.79 _a	3.64 _{ab}	2.36 _{abc}	2.10 _{bc}	1.33 _c
Older Performance:					
Frequency	15	2	63	7	9
Mean Grade	3.47 _a	5.00 _a	2.86 _a	3.71 _a	2.22 _a

Worden and Sladewski-Awig

Discriminability of Memorable and Nonmemorable Items (d')

Lists	Grades				Mean
	K	2	4	6	
D	-.18	.45	1.21	.65	.53 _a
C	1.09	1.11	.70	.94	.96 _a
A	1.28	1.52	1.58	1.58	1.49 _b
B	2.40	1.73	1.26	1.65	1.76 _c
Mean	1.15 _a	1.20 _a	1.19 _a	1.20 _a	

NOTE: Row or column means which share common subscripts do not differ significantly.